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The present invention relates to a label comprising at least one electronic component.

These days, labels incorporating electronic components are used, inter alia, in those fields where one is concerned with the protection of goods from theft. Hereby, one or more electronic components are disposed within the label for setting off an alarm when they pass through an electromagnetically, or otherwise, actuated barrier, that is, insofar as the label has not been previously deactivated, for example, when paying for the goods at the cash desk.

In this connection, there is a not infrequently occurring, serious problem that the usually highly sensitive electronic components are disposed in the labels or on the labels such that they are more or less unprotected. Since the labels themselves are usually made of less robust materials such as paper, the electronic components are not infrequently the subject of unintentional or deliberate damage which thereby puts the wanted function of the electronic components out of action.

Based upon the aforementioned disadvantages and shortcomings of the known labels, the object of the present invention is to provide a label comprising at least one electronic component wherein the electronic component is protected by and retained securely on the label.

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5 In accordance with the invention, this object is achieved by means of a label comprising at least one electronic component, whereby, in the case of the label according to the teaching of the present invention, the electronic component is cast in synthetic material.

10 Surprisingly, a label formed in this manner is exceptionally insensitive to damage since the electronic component is securely retained in and protected by the synthetic material.

15 In this connection, the skilled person will particularly appreciate that the label in accordance with the present invention can be employed not just for protecting against theft but may also be employed, for example, for locating and/or detecting the presence or absence of an object such as when one is faced with the problem of determining the current location of an object that is being sought. Here, 20 objects with which a label of this type can be employed may perhaps be files, rubbish containers or palettes that present a logistical problem which can be solved by the present invention in an advantageous manner.

25 In addition, the present invention is also suitable for use in a system for storing and transmitting data in non-contact making manner between an object (one of the aforementioned objects for example) and a control or monitoring unit.

30 In this connection, the mechanical protection of the electronic component provided by the present invention can, in each case, be perceived as being the matter of fundamental importance.

35 In accordance with a particularly inventive embodiment, the

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label is self-adhesive. The label can thereby be attached at any time to an object, goods requiring protection against theft for example, or on the windscreen of a motor vehicle. To this end, one recommendation would be that the label be at least partially provided with adhesive on at least one side thereof, the adhesive preferably being of low adherency.

In order to reliably prevent as yet unused labels from undesirably sticking together due to the adhesive coating when the labels are stored or kept in stacked layers or piles, it is expedient to provide the side of the label that is coated with an adhesive with a protective foil. This protective foil is preferably siliconised so as to allow the protective foil to be easily and completely removed from the adhesive coating when the label is to be applied to an object.

As an alternative or as an addition to the previously described self-adhesive property, the label comprises, in accordance with a preferred embodiment of the present invention, at least one attachment means, which may for example, be in the form of at least one ribbon or at least one cord. It is advantageous here, if the label is in the form of a tag.

In dependence on the intended field of use, the synthetic material may be transparent or coloured. Particular aesthetic expectations can thereby be taken into account in every case without the whole visual impression being disturbed in any way by the label.

As regards the synthetic material in which the electronic component is cast, this may, to particular advantage, comprise at least one polyurethane resin i.e. a resin based

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on polyurethanes. Polyurethane resins are obtained predominantly from air-drying oils (triglycerides, unsaturated fatty acids) which are initially doubly decomposed using glycerine into a mixture of monoglycerides and diglycerides. The products resulting thereby are then converted into products, which no longer contain isocyanate groups and which dry and set like alkyd resins by virtue of an air oxidation process, using diisocyanates, preferably toluene diisocyanates (TDI) whereby the molecular ratio between isocyanate groups and hydroxy groups is less than or equal to one.

Polyurethane resins may be produced alternatively, from diisocyanates and polyalcohols (for example, glycerine, pentaerythrite) which have been partially esterified using unsaturated acids (for example, using tall oil). These are superior to the usual alkyd resins as regards drying speed and resistance to hydrolysis.

Finally, polyurethane prepolymers having terminal free or blocked isocyanate groups, which harden due to the effects of moisture and may be thermally activated if necessary, are also to be reckoned amongst the polyurethane resins.

As already mentioned above, the polyurethane resin preferably comprises the components, isocyanate and polyol.

In regard to the manufacture of labels in accordance with the present invention, two variants are basically conceivable, whereby in the first, the label is formed by flowing liquid polyurethane resin from a nozzle and then casting the electronic component in the liquid polyurethane resin. It is advantageous hereby if the flow and casting processes take the form of a drip process.

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As an alternative thereto, the label may be formed by casting the electronic component in liquid polyurethane resin in a mould, whereby the mould preferably has a smoothed surface. To this end, the mould may be polished and/or lined with silicon.

In accordance with one advantageous embodiment of the present invention, the label comprises a support layer preferably consisting of synthetic material or paper which is optionally transparent or coloured and/or which may be provided with at least one imprint whereby the imprint may for example, provide information regarding the usage or the function of the label.

If the label in accordance with the present invention is coated with an adhesive as was proposed in an embodiment hereinabove, then the support layer may be provided between the synthetic material and the adhesive.

In accordance with a particularly inventive development of the present label, there is provided at least one electroluminescent device which is suppliable with energy in appropriate manner via at least one antenna and/or at least one battery. As an alternative or in addition thereto, the colour and/or the shape of the illuminated region of the electroluminescent device may be controllable by means of a remote data transmission.

The electroluminescent device advantageously comprises at least one electroluminescent dyestuff which, for example, luminesces in colour in an alternating electrical field between the plates of a capacitor. In accordance with one expedient embodiment, the electroluminescent dyestuff is applied by printing, preferably being imprinted on the support layer of the label.

5 In dependence on the use to which the label is put, the electronic component may, for example, be an antenna, a battery, a chip, a capacitor, a digital circuit element, a circuit, a printed oscillatory circuit, a solar cell, a coil, a power storage means and/or a transponder.

10 It is advantageous if the label in accordance with the present invention has a rectangular shape and/or is very thin, whereby this last mentioned property is of especial significance when the label is in the form of a security label for goods. In this case, it is of basic importance that the label should not wear out.

15 A multiplicity of other applications of use for the labels in accordance with the present invention is conceivable. By way of example, mention will just be made here, of the employment of the label as a part of a toll deducting system, in which case the label would preferably be arranged
20 on the windscreen of a motor vehicle.

25 Further, embodiments, features and advantages of the present invention will be explained in more detail hereinafter with the aid of the embodiments illustrated by way of example in Figures 1 and 2 of the drawing. Therein

30 Figure 1 shows a first embodiment of a label in accordance with the present invention in the form of a sectional view; and

Figure 2 shows a second embodiment of a label in accordance with the present invention in the form of a sectional view.

35 Identical references in Figures 1 and 2 refer to the same or similar parts or features.

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5 The label shown in Figures 1 and 2 is not only utilised in theft prevention systems but is also utilised for locating and/or detecting the presence or absence of an object for example, such as when one is faced with determining the current location of an object that is being sought. Here, objects with which a label of this type can be employed and on which the label is placed or to which the label is applied may perhaps be files, rubbish containers or palettes that present a logistical problem which can be solved by the present invention in an advantageous manner.

15 In addition, the label illustrated in Figures 1 and 2 is also suitable for use in a system for storing and transmitting data in non-contact making manner between an object (one of the aforementioned objects for example) and a control or monitoring unit.

20 In this connection, the mechanical protection of the electronic component 2 provided by the label illustrated in Figures 1 and 2 can, in each case, be perceived as being the matter of fundamental importance as will be explained hereinafter. Although this cannot be explicitly derived from the illustration in Figures 1 and 2, it should be mentioned here that the label is rectangular and very thin.

25 A first embodiment of a label in accordance with the present invention is illustrated in Figure 1 in the form of a sectional view.

30 The label comprises an electronic component 2 which is cast in synthetic material 1. In dependence on the use to which the label is put, the electronic component 2 may, for example, be an antenna, a battery, a chip, a capacitor, a digital circuit element, a circuit, a printed oscillatory

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circuit, a solar cell, a coil, a power storage means or a transponder.

5 Furthermore, as is apparent from Figure 1, the label is self-adhesive. The label can thereby be applied to an object at any time. To this end, the label is provided with an adhesive 4 of low adherency on its lower surface i.e. on the side thereof facing the object.

10 The synthetic material 1 is transparent. As regards the synthetic material 1 in which the electronic component is cast, this is a polyurethane resin i.e. a resin based on polyurethanes. Polyurethane resins are obtained
15 predominantly from air-drying oils (triglycerides, unsaturated fatty acids) which are initially doubly decomposed using glycerine into a mixture of monoglycerides and diglycerides. The products resulting thereby are then converted into products, which no longer contain isocyanate groups and which dry and set like alkyd resins by virtue of
20 an air oxidation process, using diisocyanates, preferably toluene diisocyanates (TDI) whereby the molecular ratio between isocyanate groups and hydroxy groups is less than or equal to one. As already mentioned above, the polyurethane resin preferably comprises the components, isocyanate and
25 polyol.

The manufacture of the label illustrated with the aid of Figure 1 is effected by casting the electronic component 2 in liquid polyurethane resin in a mould, whereby the mould
30 preferably has a smoothed surface. To this end, the mould may be polished and lined with silicon.

A second embodiment of a label in accordance with the present invention is illustrated in Figure 2 in the form of
35 a sectional view, this differing from the first embodiment

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of Figure 1 basically in that the label comprises a coloured support layer 3. Here, the support layer 3 is provided between the synthetic material 1 and the adhesive 4 which covers portions of the lower surface i.e. the side of the support layer 3 remote from the synthetic material 1.

In the illustration of Figure 2, an electroluminescent device 5 that is suppliable with energy via an antenna 6 is provided on the upper surface i.e. on the side of the support layer 3 facing the synthetic material 1. Here, the colour of the illuminated region of the electroluminescent device 5 is controllable by means of a remote data transmission.

The electroluminescent device 5 comprises an electroluminescent dyestuff which lights up in colour in an alternating electrical field between the plates of a capacitor. Here, the electroluminescent dyestuff is imprinted on the support layer 3 of the label.

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